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# GROWING NECTARINES

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Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in original containers under lock and key—out of the reach of children and animals—and away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is a danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

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Dispose of empty pesticide containers promptly. Have them buried at a sanitary land-fill dump, or crush and bury them in a level, isolated place.

NOTE: Some States have restrictions on the use of certain pesticides. Check your State and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Environmental Protection Agency, consult your county agricultural agent or State Extension specialist to be sure the intended use is still registered.



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# GROWING NECTARINES

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Nectarine trees are identical to peach trees in foliage, bud and branch characteristics, in fruiting habits, and in growth responses. The chief difference between nectarines and peaches is that nectarine fruits have no pubescence (fine, short hairs). All peach fruits have pubescence. In addition, nectarine fruits produced from peach fruits by breeding usually have smaller size, more aroma, higher sugar content, and richer flavor than their peach parents. In our present nectarine varieties, the latter shortcomings and advantages of nectarine fruits have been mostly eliminated. By selective breeding, their size has been increased, but their aroma and flavor are now seldom distinctive.

Nectarine fruits may have white, yellow, or red flesh, just as peaches do. Their seeds cannot be distinguished from peach seeds. Flower and leaf-gland types vary in the same range in peaches and nectarines. Chilling requirements of buds to break their rest period have the same range from short to long. Lack of pubescence is the only practical distinguishing feature of the nectarine.

A peach tree may produce by mutation a branch bearing nectarines. The nectarine character is a single gene recessive. A nectarine tree has seldom, if ever, produced branch bearing peaches. A peach seed of hybrid origin may develop into a nectarine tree if the peach parent was heterozygous for the nectarine character. A nectarine seed may produce a peach tree if it came from a flower that was pollinated by peach pollen. Peach branches bearing fruits part nectarine and part peach have been observed.

Nectarine trees can be grown wherever peach trees are grown, but similar economic success often does not follow. The lack of pubescence makes the nectarine fruit more susceptible to brown rot disease and insect attack, and severely limits areas of production. Breeding more resistant nectarine fruits and developing better fungicides and insecticides may eventually overcome this disadvantage.

At present (1974), most nectarines are grown in the dry Central Valley of California under irrigation. Over the 5-year period 1969-73, 98 percent of the U.S. annual production of about 75,000 tons originated in California. The other 2 percent was produced mainly in Pennsylvania, Florida, New Jersey, and Washington,

and to a lesser extent in Colorado, Idaho, Oregon, New York, Virginia, Illinois, Michigan, and Ohio. All are important peach producing States.

Most nectarines are sold for fresh consumption. If market conditions warrant processing, they may also be canned, dried, or frozen.

## ORCHARD SITES

Climate and soils are the most important considerations in selecting an orchard site for nectarines. The concentration of the industry in a relatively small area emphasizes the needs for low humidity at harvest time, freedom from frost at blossoming time, and adequate soil fertility.

### Climate

A dry climate with no rainfall and with low humidity for 2 to 3 weeks before harvest is ideal. The ripening nectarine fruits with their lack of pubescence are readily infected by brown rot fungi. Insects, including bees, prefer nectarine fruits to peach fruits for their foraging. They spread the fungus spores, and, by injuring the fruit, provide easy entrance for infections. If the weather is dry just preceding harvest, fruit injuries may heal without infection by the brown rot organism.

Heavier dews and the greater exposure to high humidity during longer nights in late summer and early fall increase the brown rot problem. For this reason, brown rot is more serious on late-ripening varieties of nectarines in California than on early ripening varieties. Good air drainage is important in selecting a site on this account, as well as for frost protection for blossoms. Where a large body of water helps provide frost protection during bloom, it has the disadvantage of raising humidity during harvest.

Anyone attempting to grow nectarines in other than a dry climate must be prepared to follow an intensive spray program for brown rot and insect control, followed with postharvest treatments of the fruit with fungicides. Isolation of the orchard from peach or plum orchards that might be sources of infection, orchard sanitation to remove all mummified and dropped fruit from the orchard, spring cultivation to destroy buried mummies before they form spores, and other preventive practices are necessary to keep infection at a minimum. Growing trees in a state of low vigor, where minimum new growth is made and where fruit is well exposed to sunlight and air movement, would assist in disease control. Heavy, dense growth and strong tree

vigor increase the disease hazards. Cover crops during harvest raise the humidity in the orchard and may be a disadvantage.

A site that is elevated above surrounding land or that slopes to provide air drainage helps to prevent frost damage to blossoms. Cold, heavy air moves downhill, and results in air movement which lessens frost formation. Level sites without air drainage are suitable for nectarine growing only in equable climates, as in the Central Valley of California.

If nectarine production is attempted in Northern States, bud and tree hardiness must be considered. Nectarine trees are as susceptible to cold injury as are peach trees. Temperatures below 0°F frequently kill dormant fruit buds. Colder temperatures may kill the trees themselves. Varieties differ in their hardiness.

In the extreme Southern States, warm winter temperatures can result in lower production. Nectarine buds require winter chilling to break their rest period. Some varieties require more chilling than others and varieties adapted to winters in a particular location should be selected if crop failure is to be prevented.

## Soils

Nectarine trees grow best on a deep, well-drained soil of medium texture. Lighter, sandy soils are suitable if root-knot nematodes are not present or if nematode resistant rootstocks are used. Heavy or poorly drained soils limit growth, production, and longevity of trees. Shallow soils, or those underlain by impervious clay or hardpan, make trees more subject to drought. Also, they often lack fertility. Soils infected with root rots should be avoided.

Where rainfall is limited, some means of irrigation must be provided to carry the trees through dry periods. In areas receiving some summer rainfall, a little supplemental irrigation may be adequate. In dry regions, 4 to 6 inches of water per month should be applied during the summer.

## VARIETIES

Most nectarine varieties now being grown commercially originated in private and public breeding programs in the last 30 years. Private breeders generally patent their varieties, limit the production of trees to certain sources, and a royalty is charged on each tree sold. Public agencies seldom patent their varieties.

Sixty-seven varieties of nectarines were shipped in California in 1973. They ripened from late May to late August. Improved

new varieties are rapidly replacing older ones so that any current list soon becomes obsolete. The 10 leading varieties in 1973 in order of ripening were Red June, Early Sun Grand, Independence, Sun Grand, Red Grand, Le Grand, Late Le Grand, Gold King, Regal Grand, and Autumn Grand. Newer varieties increasing in popularity, as shown by recent plantings, are Mayred, Armking, May Grand, Flavortop, Fantasia, Bob Grand, and Flamekist. The Sunred variety has been heavily planted in Florida. The New Jersey Agricultural Experiment Station (A.E.S.) has introduced 10 Nectared varieties. Delicious and Red Gold varieties are being tried also in various parts of the United States.

The important varieties are briefly described, in approximate order of ripening.

Sunred.—Florida A.E.S. introduction, not patented. Ripens very early, May 10 to 15 in Florida. Fruit small, highly colored, attractive. Flesh yellow, firm, semifreestone. Chilling requirement: approximately 300 hours.

Armking.—Patented. Ripens very early, about with Cardinal peach. Fruit large sized for an early nectarine. Skin attractive yellow overlaid with bright red. Flesh yellow and semifreestone. Trees vigorous. Chilling requirement: short.

May Grand.—Patented. Ripens very early. Fruit large for an early nectarine. Skin yellow mostly overspread with attractive red. Flesh yellow and semifreestone. Trees of medium vigor.

Red June.—Patented. Ripens early. Fruit medium sized with attractive bright red skin. Flesh yellow, freestone.

Early Sun Grand.—Patented. Ripens early, about with Redhaven peach. Fruit medium sized with attractive red blush. Flesh yellow, freestone. Trees vigorous.

Independence.—U.S. Department of Agriculture (USDA) introduction, not patented. Ripens early, about with Early Sun Grand. Fruit medium sized with attractive red blush. Flesh yellow, firm, freestone. Trees productive.

Nectared 4.—New Jersey A.E.S., not patented. Ripens early, about with Triogem peach. Fruit large sized, nearly full-blushed with red over yellow. Flesh yellow, semifreestone. Trees productive.

Sun Grand.—Patented. Ripens early midseason, about 10 days after Early Sun Grand. Fruit medium sized with attractive red blush over yellow. Flesh yellow, freestone. Trees medium vigor.

Flavortop.—USDA introduction, not patented. Ripens early midseason, with Sun Grand. Fruit large, yellow skin color blushed with red. Flesh yellow, firm, freestone, with excellent flavor. Trees vigorous and moderately productive (fig. 1).

Delicious.—Patented. Ripens at midseason. Fruit large, with



FIGURE 1.—Flavortop nectarines are large and have excellent flavor.

yellow skin mottled with red. Flesh yellow, firm, freestone. Trees vigorous and productive.

**Red Gold.**—Patented. Ripens midseason, immediately after Sun Grand. Fruit medium to large, skin yellow largely over-spread with red. Flesh yellow, firm, freestone. Trees vigorous.

**Nectared 6.**—New Jersey A.E.S. introduction, not patented. Ripens midseason, with Goldeneast peach. Fruit large, skin nearly full red over yellow. Flesh yellow, freestone. Trees productive.

**Fantasia.**—USDA introduction, not patented. Ripens mid-season, about a week to 10 days after Flavortop. Fruit large, with attractive red blush over yellow. Flesh yellow, firm, freestone. Trees vigorous and moderately productive.

**Red Grand.**—Patented. Ripens midseason, several days later than Fantasia. Fruit large, with attractive red overall color. Flesh yellow, clingstone. Trees vigorous but sometimes light producers.

**Le Grand.**—Patented. Ripens midseason, about with Elberta peach. Fruit large with red blush over green-yellow, some russeting. Flesh yellow, clingstone. An older variety gradually being replaced by newer, more attractive varieties.

**Late Le Grand.**—Patented. Ripens midseason, about a week after Le Grand. Fruit large with red blush over green-yellow, some russeting. Flesh firm, yellow, clingstone. Old variety being replaced.

**Bob Grand.**—Patented. Ripens midseason, with Late Le Grand. Fruit large, more highly colored and more attractive

than Late Le Grand. Flesh yellow, firm, clingstone. Trees large and productive.

Gold King.—Patented. Ripens late midseason, about 10 days after Late Le Grand. Fruit large, skin green-yellow with red color over one-third surface. Flesh, yellow, firm, clingstone. It is a late-ripening mutation of Le Grand with a characteristic early ripening suture.

Regal Grand.—Patented. Ripens late, about a week after Gold King. Fruit large with a light-red blush over yellow. Flesh yellow, firm, clingstone. Trees large and productive.

Flamekist.—USDA introduction, not patented. Ripens late, a few days later than Regal Grand. Fruit similar to Regal Grand, large with a light-red blush over yellow. Flesh yellow, firm, good flavor, clingstone. Trees large and productive.

September Grand.—Patented. Ripens late, nearly a week after Regal Grand. Fruit large with a light-red blush over yellow. Flesh yellow, firm, clingstone, with tendency to growth crack in some years. Trees large and productive.

Autumn Grand.—Patented. Ripens late, about with September Grand. Fruit large with a light-red blush over yellow. Flesh yellow, firm, clingstone. Trees large.

New and improved varieties of nectarines are continually being developed. Varieties in the orchard are changed by budding if the trees are small, or by grafting into larger trees (fig. 2).



FIGURE 2.—Old orchard recently grafted to change varieties. Nurse limbs on each tree lessen shock of severe pruning.

Consult your local Farm Advisor or County Agricultural Agent for latest improvements in varieties.

## **ESTABLISHING THE ORCHARD**

Most nectarine growers find it advantageous to purchase commercially grown nursery trees rather than to propagate their own. Trees 4 to 6 feet tall, with a trunk caliper of  $\frac{1}{2}$  to  $\frac{3}{4}$  inch, are easy to prune and train. Smaller trees, from 2 to 3 feet tall, will develop into equally good orchard trees if not neglected. The trees may be either June-budded or dormant-budded; both are equally successful. Both have one-season's top growth. Nursery trees with 2 year's top growth are usually more expensive.

### **Rootstocks**

Most nectarine trees are propagated on Nemaguard rootstock, which is resistant to rootknot nematodes. In soils where these nematodes are not present, ordinary peach seedlings are satisfactory as rootstocks. Cannery seed is a common source of seed for peach nurseries. Nectarine trees on plum rootstocks are weaker and often short lived.

### **Care of Nursery Trees**

Bare-rooted trees are furnished by the nurseries during the dormant season. If it is necessary to hold them before planting, they should be separated and the roots buried in a well-drained moist soil. Pack the dirt around the roots to prevent drying out. Wet sawdust or other damp packing material to protect the roots may be satisfactory in a cool, protected location. Cold storage with high humidity is best for longer storage periods.

### **Spacing**

Nectarine trees are commonly planted on the square, 20 feet apart (fig. 3). The rectangular pattern on fairly level land makes cultivation and other orchard practices easier than other patterns.

On sloping land, contour planting is used to help control erosion. On steep slopes, terracing and contour planting is advisable.

### **Planting**

Dormant nursery trees are commonly planted in late winter or early spring. In nonirrigated areas with moderate climates, late fall and early winter planting gives the roots a chance to become

established before top growth starts. Where severe freezes occur, planting is best delayed until early spring.

The soil should be thoroughly disked or plowed before planting. Working narrow strips of the tree rows is sufficient. The loose soil encourages root growth. Competing weed growth is destroyed. The soil should be moist but not too wet to work at time of planting.

Roots of the nursery trees should not be allowed to become dry. Hauling them to the field in a barrel of water while planting is advisable. Broken or diseased roots should be cut off. Shortening long roots balances the root system.

The planting hole should be wide and deep enough to contain the roots without bending (fig. 4). Hold the tree upright with the roots at the same depth they were in the nursery. Sift soil around roots and step on it while filling the hole to remove air pockets and to bring the soil in close contact with roots. Fill the hole to ground level. Water or irrigate if soil is dry or if it becomes dry.

An application of nitrogen fertilizer will stimulate growth of newly planted trees. Care should be taken not to burn the roots. Scatter no more than  $\frac{1}{8}$  to  $\frac{1}{4}$  pound ammonium sulfate or other nitrogen fertilizer evenly over a 3-foot circle around the tree. Additional applications later in the season may give further stimulation of growth.



FIGURE 3.—Nectarine trees are usually planted on the square, 20 feet apart each way.

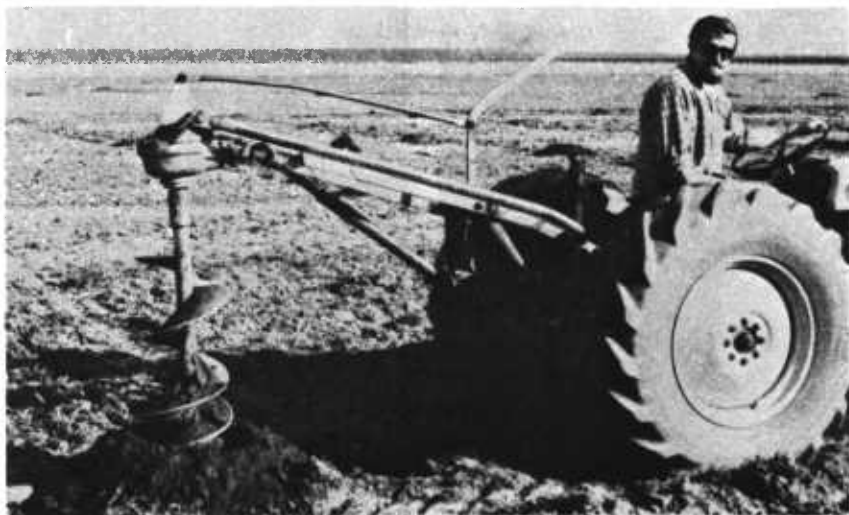


FIGURE 4.—Power digger for making planting holes.

## TRAINING AND PRUNING

Nectarine trees need to be shaped by pruning so they may produce heavy crops of large, well-colored fruit. All pruning is dwarfing. Young trees should be pruned as little as possible. Bearing trees are pruned annually to maintain vigor and tree size, increase fruit size, and help prevent overbearing.

### Young Trees

The top of the nursery tree should be cut back at planting to balance it with the severely pruned roots (fig. 5). This reduces the number of growing points and invigorates the remaining ones. Smaller trees may be cut back to 18 inches in height, taller ones to 30 inches. Lateral branches within 12 inches of the ground should be cut off close to the trunk.

Higher branches should be stubbed back only, to leave the basal leaf buds intact. Strong laterals may be selected at planting time and left to form the scaffold branches of the tree if correctly positioned on the trunk. They should be cut back to 4 to 6 inches in length.

The scaffold branches may be selected when new shoots are 3 to 4 inches long. Three branches are usually adequate, but four may be needed. They should be evenly positioned on the trunk, but may arise at one point or may be separated vertically. They should grow outward rather than upward to avoid making a narrow-angled, weak crotch. Other shoots should be pinched

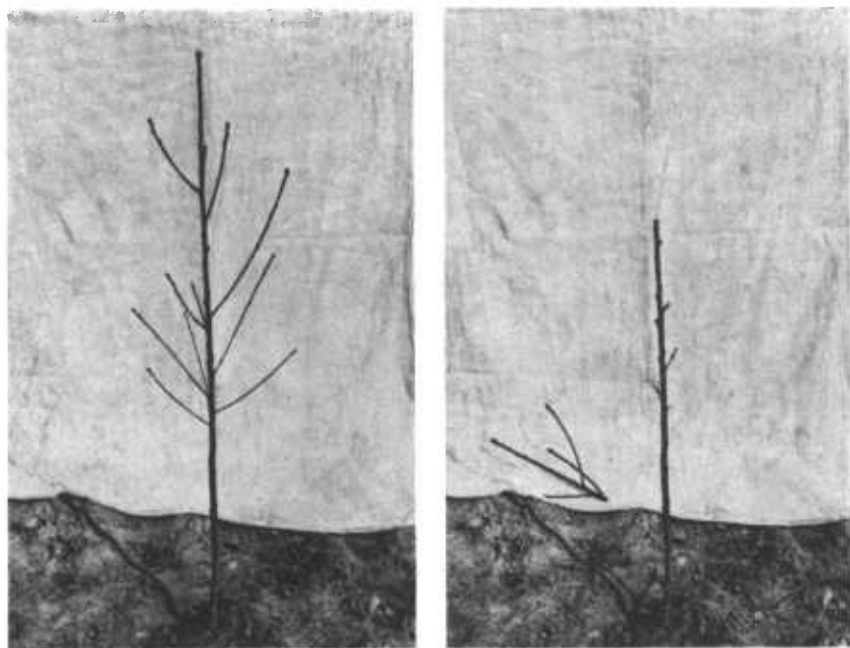


FIGURE 5.—Newly planted nectarine tree before and after pruning. Note tree on right headed back to 30-inch height and strong laterals stubbed to preserve basal buds.

back at this time and later also to force growth of the selected branches. Pinching back undesired shoots is less of a setback to young trees than cutting them off entirely.

The scaffold branches may be selected at the first dormant season's pruning, if not done earlier. Three or four branches forming a uniform head for the tree are cut back to outgrowing laterals, which arise on these branches 2 or 3 feet from the trunk (fig. 6). The laterals will continue their direction of growth and spread the tree. Longer branches may be left on more vigorous trees. Other branches arising from the trunk should be removed. Lateral branches on the scaffolds, which grow toward the center of the tree or which interfere with each other, should be pruned off. Light pruning of young trees is best to secure early production.

In the second dormant season, five to seven lateral branches on the primary scaffolds are selected to form secondary scaffold branches 4 to 5 feet from the ground (fig. 7). These should be well spaced around the tree to spread the tree and to form the principal framework. Laterals closer to the trunk and other secondary branches should be removed. The center of the tree should be kept open to maintain vigor and fruit production on lower levels.

The secondary scaffolds should be headed back lightly to outside laterals. Some scaffolds may have to be cut heavier than others to balance the shape of the tree. The scaffold branch highest on the trunk must be kept strong to prevent its being overgrown by the lower scaffolds.

The third dormant season pruning should also be light. It consists of a light heading back (unless the trees have already reached the desired height and need lowering), and a thinning out of bearing wood to limit the crop (fig. 8).

## Mature Trees

The shape of the tree has been determined in the first few years. Pruning mature trees maintains a balance between growth and fruiting. Heavy pruning reduces the crop and in-



FIGURE 6.—One-year-old nectarine tree after pruning. Four well-positioned laterals selected for scaffold branches and headed back to outside laterals to balance tree.



FIGURE 7.—Well-balanced, 2-year-old tree after pruning. Note seven secondary scaffolds arising from four primary scaffold branches, open center, and heading back to outside lateral branches.

creases tree vigor. Light pruning permits the tree to set heavier crops and tree growth is retarded. The height and size of the tree is maintained by pruning.

Pruning consists of thinning out the previous season's growth, cutting back or entirely removing vigorous growths in the top of the tree, and cutting back hangers on the scaffolds to laterals to renew the fruiting wood (fig. 9). A dense top center, which shades and weakens lower branches, should be avoided (fig. 10). In maintaining the open center of the tree, foliage should be left to shade the scaffold branches to avoid sunburn damage.

## THINNING

Thinning of the nectarine fruit is necessary to produce marketable-sized fruit, to prevent limb breakage of overloaded branches, to promote early ripening, and to stimulate vegetative

growth adequate to produce next year's crop. Careful hand thinning is usually needed.

Early maturing varieties should be thinned as soon as economically possible. Early thinning, even blossom thinning, is more effective than later thinning in increasing fruit size. It is also



FIGURE 8.—Four-year-old nectarine tree with good secondary and tertiary branching to form well-shaped, well-balanced tree.



FIGURE 9.—Five-year-old, unpruned nectarine tree with strong crotch and good secondary branching.



FIGURE 10.—Well-balanced, old nectarine tree with strong scaffold structure.

more expensive. Time of thinning of late-ripening nectarines, which are naturally large sized, is much less critical and can be delayed until after the first drop occurs.

Malformed fruits should be removed first in thinning. Smaller fruits should also be removed in thinning for they will also be smaller at harvest. Clusters of fruit should be broken up. Individual fruits on small-fruited varieties should be spaced 6 to 8 inches apart on the branch. Five to 6 inches is adequate spacing for most large-fruited, late-maturing varieties.

Some growers base their thinning on total number of fruits per tree rather than on a particular spacing between fruits. This method works out very well for those experienced in estimating how many mature fruits a tree can size properly.

Chemical spray thinning would save much labor, but general recommendations for chemical thinning are not yet possible.

## FERTILIZERS

Nitrogen is the element most commonly lacking in orchard soils. Nectarine trees respond to nitrogen fertilizer applications by greater vigor, more foliage, larger fruit, later fruit maturity, and less attractive fruit. *Too much nitrogen fertilizer is harmful to market quality.*

Orchards that lack nitrogen have yellow foliage, short growth, lower production, smaller and more highly colored fruit, and earlier fruit maturity. The proper amount of fertilizer needed to strike the important balance between growth and fruiting depends on soil fertility and other conditions. It is best determined by trial or from the response in growth from a previous nitrogen application in a particular orchard.

The best time to apply nitrogen fertilizer is in the fall or early spring. Summer applications before harvest may adversely affect fruit color and appearance. Almost any nitrogen carrier will be satisfactory except that alkaline carriers, such as sodium nitrate, are best used on acid soils and acid fertilizers, such as ammonium sulfate on alkaline soils.

Nectarine trees will respond to potash applications when the soil is low in potassium. Two to 4 pounds of muriate or sulfate of potash per tree applied in early spring are usually adequate.

Phosphorous is needed by nectarine trees but is seldom deficient. Trees are able to pick up the needed phosphorus even in soils where cover crops suffer from lack of phosphorus.

Magnesium is sometimes deficient in nectarine orchards. Foliar sprays of 10 pounds of magnesium sulfate per 100 gallons of water easily correct this deficiency. Soil applications of 2 tons of dolomitic limestone per acre are effective also.

Zinc deficiency in nectarine trees is identified by small yellow foliage with the veins retaining green coloring. It is corrected by dormant sprays containing basic zinc sulfate or foliar sprays containing zinc oxide applied according to manufacturers' directions.

## SOIL MANAGEMENT

Most nectarine orchards are clean cultivated while the fruit is on the trees. An early cultivation well before bloom is necessary to destroy mummies in the ground—which spread brown rot—and to reduce the populations of sucking insects. To reduce the frost hazard to blossoms and young fruit, the ground should not be cultivated during and just after bloom. Cover crops or weed growth during harvest could promote brown rot infection by raising the humidity in the orchard. Young orchards need cultivation to eliminate weed competition and to stimulate growth (fig. 11).

Cover crops after harvest may improve soil tilth and water penetration and, if legume, add nitrogen to the soil (fig. 12).

Permanent sod covers should be avoided, except under very special circumstances. They usually result in poorer tree growth, lower production, and increased insect-injured fruit.



FIGURE 11.—Fall harrowing in young nectarine orchard. Furrows must be leveled for shredding prunings.



FIGURE 12.—Barley winter cover crop in nectarine orchard.

## HARVESTING

Nearly all nectarines are shipped fresh to markets. The nectarines sent to local or nearby markets are picked when they are more mature than those intended for distant markets. Maturity

is determined by the firmness of the flesh, the changing of the ground color from green to yellow in yellow-fleshed nectarines, the equal filling out of both halves of the fruit, the attaining of full red color, the freeness of the pit, and the "give" of the fruit when transverse or twisting hand pressure is applied. Ground color changes are usually one of the best indicators. The full red color of some varieties makes it difficult to use ground color as the basis for determining their maturity.

It is important to pick nectarines as mature as possible and yet have them reach the consumer in good condition. Quality improves as ripening on the tree proceeds, and the fruits increase in size daily. Several pickings should be made to cover the ripening period of a week to 10 days (figs. 13, 14, 15).

Nectarines are best stored and shipped at 31° to 32° F and at 90 percent humidity. They may be held for 2 or 3 weeks and still have good dessert quality. When stored for longer periods, red to brown discoloration of the flesh occurs.



FIGURE 13.—Harvesting nectarines in picking buckets, using 10-ft. ladders.



FIGURE 14.—Emptying picking bucket in bins on trailer for hauling to packing-house.



FIGURE 15.—Place packing nectarines in shipping lugs. Sometimes fruit is pre-sized.

## FUNGUS AND BACTERIAL DISEASES

The most important fungus and bacterial diseases attacking nectarines are brown rot, scab, bacterial spot, and peach leaf curl.

### Brown Rot

Brown rot is a fungus disease that attacks blossoms, twigs, and fruit. On the surface of infected parts, masses of ash-gray powdery spores appear. Infected blossoms wither and die. The fun-

gus moves into adjacent twigs and forms cankers. Spores from these cankers are a source of infection as the fruit ripens and for the following year. Rotted fruit or mummies left on the tree or undisturbed on the ground are sources of infection also.

Blossom infection is controlled by sprays of fungicides such as sulfur, captan, or benomyl applied just before and during bloom. Mummies should be removed, and the soil disked before bloom to disturb mummies in the ground.

Fruit infections are largely controlled by fungicide sprays applied just before harvest. Protective residues are more difficult to establish on nectarine fruits than on peaches. Dipping or spraying the fruit with fungicides after harvest helps control the disease during shipment and marketing. Controlling insects in the orchard is important for they may carry spores. Brown rot infections often start in insect injuries.

Brown rot is difficult to control on nectarines, and its prevention deserves the grower's most careful attention.

## **Scab**

Scab is a fungus disease that may do serious damage in humid regions. It appears as black spots or freckles on the surface of the fruit. It attacks tender stems also to form small, brown, oval cankers where the disease overwinters.

Scab can be controlled with sulfur sprays or dusts 2 weeks after the shucks have dropped from the nectarines and again 2 weeks later.

## **Bacterial Spot**

Bacterial spot attacks leaves, twigs, and fruit. On leaves it produces small, water-soaked areas, which eventually die and drop out. They are usually angular in shape. Premature leaf fall often results. The disease forms cankers on twigs, which are believed to be the source of initial infection the following spring. On fruit, it produces small, watery-looking spots in which the tissue dies. With growth, these areas crack, and fissures develop, which mar the fruit and make brown rot infections possible.

Bacterial spot occurs in all States east of the Rockies where nectarines can be grown, but is not a problem in the nectarine-growing regions of the West. Control methods are not generally satisfactory. Vigorous trees are less susceptible. Varieties of nectarines differ in susceptibility also.

## **Leaf Curl**

Leaf curl is a fungus disease that attacks unfolding leaves in early spring. At first, infected leaves have a red to purplish tint. Later they become thickened, blistered and distorted, and then turn brown and drop.

Leaf curl can be controlled with a dormant season application of sprays containing copper, ziram, or fermate. A single application before buds begin to swell is enough.

Other fungus and bacterial diseases, such as bacterial canker, rust and crown gall, may be of importance in certain areas. Your County Agricultural Agent or Farm Advisor can advise you on their prevalence in your area and can recommend methods for their control.

## **VIRUS DISEASES**

Nectarine trees are subject to the same virus diseases as are peach trees. Their occurrence varies widely in different sections of the country. In the principal nectarine growing areas, ring spot, necrotic leaf spot, and stubby twig virus are the most prevalent. They cause only minor losses. In other areas, yellows, phony peach, stem pitting and X disease may be common.

### **Ring Spot**

Ring spot virus produces ring patterns on leaves and retards spring growth. Affected areas become necrotic and drop out. Sometimes ring spot may split and kill the bark. Usually, symptoms occur only during the first growing season after infection. Later, infected trees appear normal and are productive. The ring spot virus is still present. Buds from infected trees often fail to grow when used in propagation.

### **Necrotic Leaf Spot**

Necrotic leaf spot produces dead spots on leaves in mid-summer. It differs from ring spot in that symptoms occur each year but not in the spring. Affected trees survive and are productive.

### **Stubby Twig**

Stubby twig virus causes a yellowing and rolling of leaves on affected branches during the summer. Buds may fail to develop on some twigs, which results in long growths without new

branches. Size of fruit may be reduced, but the fruit may be firmer. Affected trees survive and produce fair to good crops of fruit.

## **INSECT PESTS**

The most common insect pests of nectarines are peach twig borers, scale insects, thrips, and oriental fruit moth. Plum curculio and peach tree borer are pests in humid regions.

### **Peach Twig Borer**

Peach twig borer is a chocolate brown worm,  $\frac{1}{4}$  to  $\frac{1}{2}$  inch in length. It works in actively growing twig terminals, which then wilt and die, or in fruit at harvest.

Control is with dormant sprays containing parathion or diazinon. The insecticide may be combined with the dormant oil spray for scale control. Additional sprays with the same insecticides, but without oil, are recommended for application during petal fall and in late May.

### **Scale Insects**

Scale insects include San Jose, Parlatoria, and other scales. They appear as small disklike bodies on the bark of twigs and branches. They also attach themselves to fruit and disfigure it. Scale insects in large numbers seriously weaken trees.

Scale are readily controlled by dormant sprays containing oil or oil plus an insecticide. In severe infestations, an insecticide applied in the spring may also be necessary.

### **Thrips**

Thrips are very small insects that damage nectarine blossoms. Because nectarine fruits do not have the protection of pubescence, thrips may cause scarring on the surface of the young fruits during bloom. These scars enlarge as the fruit grows. Damage is often serious.

Thrips populations are reduced by orchard cultivation just before bloom to eliminate cover crops and weeds. Sprays of parathion control thrips from the time they infest blossoms through the petal fall stage. Parathion will kill bees. Do not use it when bees are working in the blossoms, or if hives are within 1 mile of the orchard.

## **Oriental Fruit Moth**

The larva of the oriental fruit moth feeds in actively growing twigs and in maturing fruit. It is a ½-inch long, pinkish-white worm with a brown head. The insects overwinter as full-grown larvae in cocoons on the tree or ground. The moths first appear about blossoming time. Usually there are four or five generations per year.

Oriental fruit moth may be controlled by sprays of azinphosmethyl, carbaryl, or diazinon. Three sprays may be required, starting at 100 percent petal fall at approximately 2-week intervals.

## **Plum Curculio**

The plum curculio is a small beetle that overwinters in orchard trash. The insect lays eggs in the fruit, starting in early spring. The larvae feed in the fruit for 2 weeks or more, and then go into the ground to mature.

The control program consists of three or four applications of insecticides during the month following petal fall. Where two generations occur in one season, additional applications may be needed during the month before harvest. Usually, the control methods for oriental fruit moth also control plum curculio. The insect is less of a problem in dry areas than in humid areas.

## **Peach Tree Borer**

The peach tree borer injures trees by boring under the bark near the ground line. At this stage, it is a white worm about an inch long. It seriously injures the tree and may kill it.

The adults are clear-winged moths, which appear in the North in July and August and in the South as early as May. Eggs are laid on the trunk shortly afterwards.

Spraying the trunk with parathion or azinphosmethyl when the eggs hatch will kill the larvae. Two to four applications at 3- to 4-week intervals may be needed.